Appendix E

Public Comments and ARB Responses

November 2, 2000

E.1 Introduction

Public comments were received from Jon M. Heuss (Air Improvement Resource, Inc.) and Jaroslav J. Vostal (Environmental Health Assessment Consultants, International), both in writing and verbally at the AQAC meeting. The written comments are included in Appendix E. The verbal comments made before AQAC were based on the written comments, and transcripts can be accessed at http://www.OEHHA.ca/gpv/air/toxic-contaminants/AQAC1.html.

E.2 Summary

The points raised by Messers Heuss and Vostal can be summarized into two categories. These points, along with ARB responses, are presented below.

Point 1. The Staff Report is an incomplete assessment and analysis of all publicly available information on the various pollutants. **ARB Response:** The purpose of the reviews presented in the staff report was to consider whether there was evidence suggesting that any of the California Ambient Air Quality Standards should be reviewed with reference to adequacy of protection of infants, children and other susceptible populations. It was not the intent of Staff to provide complete reviews on each pollutant.

Point 2. Insufficient information is presented on background concentrations of various pollutants, and on the extent to which the existing State standards are exceeded. **ARB Response:** Information on background pollutant concentrations has been added. Table 3.3.1. gives information on exceedances and maximal concentrations of the various criteria pollutants in the major air basins of the State. Also, see response to Point 1.

Comments for the California ARB Public Meeting
of the Air Quality Advisory Committee.
on the Adequacy of California Ambient Air Quality Standards:
Senate Bill 25-Children's Environmental Health Protection
Berkeley, CA, October 12-13, 2000

Jon M. Heuss
Air Improvement Resource, Inc.

Jaroslav J. Vostal
Environmental Health Assessment Consultants, International

Senate Bill 25 requires that all existing California health-based ambient air quality standards be reviewed by the Air Resources Board (ARB) by December 31, 2000. The review should determine "whether, based on public health, scientific literature, and exposure pattern data, the standards adequately protect_the health of the public, including infants and children, with an adequate margin of safety." In preparation for that review, a Draft Staff Report was made available in mid-September along with a request for written comments by October 4, 2000. This is insufficient time to adequately review, evaluate, and comment on the wide range of exposure and public health issues and studies included in the Draft. Nevertheless, we want to bring several important issues to the attention of the Staff and Advisory Committee. We will be providing further discussion during the public comment period at the Advisory Committee meeting.

The September 12, 2000 Draft Staff Report is an incomplete assessment and analysis of all publicly available information on several key issues in the review. Because the Draft raises concerns about the potential health effects that may occur- in infants, children, and other potentially susceptible groups - exposed to pollutants at levels corresponding to existing California ambient air quality standards for particulate matter (PM10), ozone, and nitrogen dioxide, we focus our comments on those pollutants.

One of the factors considered in assessing the standards' health protectiveness is the "degree of exposure relative to the level of the standard." Unfortunately, Chapter 3 and Appendix B of the Draft are inadequate. They fail to mention the existence of a significant background of ozone in the troposphere that arises from sources other than California or even U. S. precursor emissions. They fail to inform the reader of the extent to which the existing state standards are exceeded throughout the state. They fail to reference a significant body of probabilistic ozone exposure analyses that include studies of children conducted by the U.S. EPA. These failures result in the omission of important facts that will have a profound influence on the health protectiveness of the existing state ozone and PM10 standards.

For example, the substantial background of ozone in the troposphere (that averages about 0.04 ppm but reaches 0.08 ppm on the order of once per year) provides a practical limit as to how low any ozone air quality standard can be set. The state ozone standard of 0.09 ppm for 1-hour is defined as an extreme value standard; it is met when the Expected Peak Daily Concentration (EPDC, that concentration expected to occur once per year) is below the level of the standard. In fact, the EPDC in the cleanest,

lowest emission density counties and air basins of California are typically between 0.075 and 0.085 ppm. This means that the amount of man-made ozone allowed by the existing state standard is on the order of 0.01 ppm. The presence of a substantial background of ozone needs to be taken into account in any decisions regarding revision of the California ozone standard.

For PM10, ARB data summaries indicate that the state 24-hour standard is exceeded throughout the state except for compliance in a few high elevation counties. The maximum EPDC in Lake County is substantially below the state 24-hour standard, but in all the other rural and remote basins, the maximum EPDC is substantially above the existing state 24-hour PM10 standard. In the Great Basin Valleys, the maximum EPDC has been on the order of 400 $\mu g/m^3$ in recent years, or 8 times the state 24-hour standard. In contrast, the state annual geometric mean standard is met in the rural and remote areas of California but not in the more urbanized air basins. However, the maximum annual geometric mean PM10 in the rural and remote basins of California (except for Lake County) varies between 20 and 30 $\mu g/m^3$. It is known that wind-blown crustal material is the major contributor to high PM10 concentrations in rural and remote areas of California. While some wind-blown dust is controllable, much is not. Therefore, the level of PM10 that is achievable with complete elimination of man-made pollution varies substantially across California. This needs to be taken into account in any decisions regarding revision of the California PM standards.

Section 3.6 on indoor and personal exposure needs to acknowledge that indoor ozone concentrations are dramatically reduced compared to outdoor concentrations (see Table B10-1) while PM exposures indoors are often elevated above outdoor concentrations. This also has important implications for the magnitude (and sources of) human personal exposure to ozone and PM10. An informed discussion of the interpretation of the existing health studies must be predicated on what is known about human exposure patterns. Therefore, the discussion of individual pollutants in Chapter 4 and Appendix C needs to include a review of the body of information on human exposure. For ozone, this includes consideration of the probabilistic analyses carried out by EPA over the past decade. For PM, this includes an expanded discussion of the body of information concerning the relation of fixed monitors to indoor and personal exposures as well as factors such as the personal cloud, indoor combustion sources, and re-suspension of coarse particles.

When EPA last reviewed the national ambient air quality standards for ozone, the probabilistic risk assessment played a key role. The U. S. EPA's Clean Air Science Advisory Committee (CASAC) concluded that because it appears that ozone may elicit a continuum of biological responses down to background concentrations, risk assessments must play a central role in identifying an appropriate level for the standard. However, when CASAC viewed the results of the probabilistic modeling, the risks for all segments of the population including outdoor children were small and the committee concluded that there was no "bright line" that distinguished any of the proposed standards as being significantly more protective of public health. The standards considered ranged from the existing 1-hour federal standard of 0.12 ppm down to levels roughly equivalent to the current California standard.

In terms of children's health, it is important to note that clinical studies show that children tolerate ozone exposures with less symptoms than do adults. Concerns that this may

result in airway injury have not been validated because they have been based on an outdated concept of ozone-induced decreases of "lung function." Studies now demonstrate that declines in the forced expiratory volume (FEV1.0) are transient and are not caused by cellular injury in the respiratory airways. Since EPA's last review, published U.S. EPA studies show that the observed "lung function" decreases are only a physiological protective mechanism that involuntarily restricts the inhaled air volume determining the outcome of the test. Declines in forced expiratory volume only represent decreases in FEV test performance and do not signal any damage to actual pulmonary function. There should be a re-interpretation, therefore, of all field studies and clinical studies using forced expiratory volumes as an index of pulmonary function changes

Many conclusions of the review are based on epidemiological studies that correlate observed health effects with monitored ambient ozone or PM10 concentrations without validating the actual personal exposures, or the delivered pollutant doses and without establishing the causal role of pollutants in these changes. The review should acknowledge that the epidemiologic studies cannot exclude other possible confounding factors and, therefore, cannot establish the causal role of ambient air pollutants in the observed effects unless plausible mechanisms are offered to explain the reported changes. These restrictions apply to all observed statistical associations of pollutants with increases in morbidity, medication consumption, or mortality. Concerns about statistical conclusions in the reported time-series studies are supported by dosimetry studies that show that the amounts of pollutants inhaled during 24 hr-exposures to current pollutant levels are too low to be responsible for complex effects such as morbidity and mortality.

As the Draft indicates, ambient PM is a mixture of many different elements and compounds, including organic, inorganic, and biologic materials. Therefore it is not surprising that EPA acknowledged in its recent PM review that there are unusually large uncertainties associated with establishing standards for PM relative to other single component pollutants. In response to the many concerns over the scientific basis for PM2.5 or PM10 standards, Congress authorized a dramatic increase in federal PM research and a National Academy of Sciences Panel was used to focus the effort on key issues. Some of that new research is now becoming available. Much more will be published over the next several years. The U. S. EPA is scheduled to release a public review draft of a new PM Criteria Document shortly. However, new studies of relevance to PM standard-setting are published monthly. As California reviews its PM standards, we urge the Staff to fully evaluate all of the available information.

In summary, we acknowledge that the California PM10 standards need to be reviewed. However, the review should be focused on identifying which, if any, of the components of ambient PM are causally related to health effects. In the case of ozone, the existing California standard is very close to peak once-per-year background levels. Since tightening the standard would not result in significant reduction in risk to children or others and any tightening of the standard would render it unachievable, we recommend against making ozone a priority for review under SB 25. The case for putting nitrogen dioxide in the first tier is weak. The controlled exposure studies cited suggest possible concern at concentrations above the existing standard. On the other hand, the existing state standard has been met everywhere in California, and ambient concentrations are expected to continue to decline for at least the next decade.

Comments for the California OEHHA/ARB Public Meeting of the Air Quality Advisory Committee on the Adequacy of California Ambient Air Quality standards: Senate Bill 25 – Children's Environmental Health Protection
Berkeley, CA, October 12-13, 2000

Jon M. Heuss
Air Improvement Resource, Inc.

As noted in the comments submitted on October 4, 2000, we are focusing our comments on the first tier of pollutants recommended by OEHHA staff for review and possible revision. In particular I will focus on ozone and particulate matter (PM).

One of the five factors considered in assessing the standards' health protectiveness is the "degree of exposure relative to the level of the standard." Unfortunately, Chapter 3 and Appendix B of the Draft do not adequately discuss this factor. They fail to mention the existence of a significant background of ozone in the troposphere that arises from sources other than California or even U.S. precursor emissions. They also fail to inform the reader, except in very general terms, of the extent to which the existing state standards are exceeded throughout the state. These failures result in the omission of important facts that influence the determination of the health protectiveness of the existing state ozone and PM10 standards.

For example, there is a substantial background of ozone in the troposphere (that averages about 0.04 ppm but reaches 0.08 ppm on the order of once per year). It arises from several sources. One source is stratospheric ozone that mixes into the troposphere and is destroyed at the ground. Another source is photochemical reactions in the troposphere of natural geogenic and biogenic emissions: methane, isoprene, terpenes, and natural Nox from lightning and biological action in the soil. This background provides a practical limit as to how low any ozone air quality standard can be set. The transport of plumes of man-made ozone downwind of cities into rural areas is another phenomenon that occurs and can cause elevated ozone in rural and remote locations. However, there is also a well-documented phenomenon known as tropopause folding that inserts plumes with high concentrations of stratospheric ozone into the troposphere. These plumes are generally inserted well above ground level where they slowly mix into the general troposphere. But on rare occasions, they have been measured at ground-level with ozone concentrations up to 0.20 ppm or higher.

The state ozone standard of 0.09 ppm for 1-hour is defined as an extreme value standard; it is met when the Expected Peak daily Concentration (EPDC, that concentration expected to occur once per year) is below the level of the standard. In fact, the EPDC in the cleanest, lowest emission density counties and air basins of California are typically between).075 and).085 ppm. Similar

peak 1-hour ozone concentrations are also measured in other remote locations in the western U.S. This means that the amount of man-made ozone allowed by the existing state standard is on the order of 0.01 to 0.02 ppm. The presence of a substantial background of ozone needs to be taken into account in any decisions regarding revision of the California ozone standard. If the ARB decides to proceed with review of the state ozone standard, ARB staff should initiate detailed field studies of ozone levels and sources in remote California locations. When the current state standard was set in 1987, staff erroneously assumed that the ozone background did not exceed 0.04 ppm.

For PM10, ARB data summaries indicate that the state 24-hour standard is exceeded throughout the state except for compliance in a few high elevation counties. The maximum EPDC in Lake County is substantially below the state 24-hour standard, but in all the other rural and remote basins, the maximum EPDC is substantially above the existing state 24-hour PM10 standard. In the Great Basin Valleys, the maximum EPDC has been on the order of 400 $\mu g/m^3$ in recent years, or 8 times the state 24-hour standard. In contrast, the state annual geometric mean standard is met in the rural and remote areas of California but not in the more urbanized air basins. However, the maximum annual geometric mean PM10 in the rural and remote basins of California (except for Lake County) varies between 20 and 30 $\mu g/m^3$. It is known that wind-blown crustal material is the major contributor to high PM10 concentratio9ns in rural and remote areas of California. While some win-blown dust is controllable, much is not. Therefore, the level of PM10 that is achievable with complete elimination of man-made pollution varies substantially across California. There is also significant variation in the composition of PM10 across the state that would be expected to alter the toxicity per unit mass of PM. These variations need to be documented and taken into account in any decisions regarding revision of the California PM standards.

Section 3.6 on indoor and personal exposure needs to acknowledge that indoor ozone concentrations are dramatically reduced compared to outdoor concentrations (see Table B10-1) while PM exposures indoors are often elevated above outdoor concentrations. This also has important implications for the magnitude (and sources of) human personal exposure to ozone and PM.10. An informed discussion of the interpretation of the existing health studies must be predicated on what is known about human patterns. For ozone, this includes consideration of the probabilistic analyses carried out by EPA over the past decade. For PM, this includes consideration of the body of information concerning the relation of fixed monitors to indoor and personal exposures as well as factors such as the 0personal cloud, indoor combustion sources, and re-suspension of particles. Recent studies involving real-time measurements indicate that indoor activities such as cooking, cleaning, and even brisk walking generate high short-term exposures to ultrafine, coarse and fine PM. If outdoor PM is as dangerous as suggested by some epidemiologic studies, then these everyday human activities involve similar risks.

Another of the five factors that was considered in assessing the existing standards' health protectiveness is "the level of risk of effects anticipated at or near the level of the existing standard." When EPA last reviewed the national ambient air quality standards for ozone, the probabilistic risk assessment that will be discussed by Dr. Vostal played a key role. The U.S. EPA's Clean Air Science Advisory Committee (CASAC) concluded that because it appears that ozone may elicit a continuum of biological responses down to background concentrations, risk assessments must play a central role in identifying an appropriate level for the standard. However, when CASAC viewed the results of the probabilistic modeling, the risks for all segments of the population including outdoor children were small and the committee concluded that there was no "bright line" that distinguished any of the proposed standards as being significantly more protective of public health. The standards considered ranged from the existing 1-hour federal standard of 0.12 ppm down to levels roughly equivalent to the current California standard.

Although EPA promulgated an 8-hour ozone standard of 0.08 ppm, which is intermediate in stringency between the 1-hour federal standard and the existing California standard, EPA could not defend its choice adequately to the Court of Appeals when challenged by a group of small and large businesses as well as several states. The Court of Appeals noted that EPA regards ozone definitely and PM, likely, as non-threshold pollutants, that is ones that have some possibility of some adverse health impact (however slight) at any exposure level above zero. The court indicated that, therefore, the only concentration for ozone and PM that is utterly risk-free, in the sense of direct health impacts, is zero, and for EOA to pick any non-zero level, it must explain the degree of non-perfection permitted. However, the court found that EPA articulated no "intelligent principle" in applying the factors used to determine the public health concern associated with different levels of ozone and PM and remanded the new ozone and PM standards back to EPA. This issue is now in the U.S. Supreme Court.

No matter what the Supreme Court decides, California will have to address the same issues under SB 25 of what standards protect the public health, with an adequate margin of safety. Before any of the existing standards are revised, a much more extensive and critical review of the literature must be carried out, and some formal decision analytic framework or risk assessment procedure will be required.

For ozone, there is another factor that EPA is required to consider. The Court of Appeals ruled that the beneficial effects of ground-level ozone (in shielding the public from the harmful effects of the sun's ultraviolet rays, including cataracts and skin cancers) must be weighed in the same manner that ground-level ozone's ill effects are weighed. Although stratospheric ozone provides the main protection against UV, it is actually the total column of ozone that provides protection.

Turning to PM, as the Draft indicates, ambient PM is a mixture of many different elements and compounds, including organic, inorganic, and biologic materials. Therefore it is not surprising that EPA acknowledged in its recent PM review that there are unusually large uncertainties associated with establishing standards for PM relative to other single component pollutants. In response to the many concerns over the scientific basis for PM2.5 or PM10 standards, Congress authorized a dramatic increase in federal PM research and a National Academy of Sciences Panel was used to focus the effort on key issues. Some of that new research is now becoming available. Much more will be published over the next several years. The U.S. EPA is scheduled to release a public review draft of a new PM Criteria document shortly. However, new studies of relevance to PM standard-setting are published monthly. As California reviews its PM standards, we urge the Staff to fully evaluate all of the available information.

In summary, we acknowledge that the California PM10 standards need to be reviewed. However, the review should be focused on identifying which, if any, of the components of ambient PM are casually related to health effects. Among the hypotheses offered that may explain the PM-health associations are PM10 mass itself, fine particle mass, ultra fine PM, particle number count, particle surface area, reactive transition metals, acids, organic compounds, biogenic particles, sulfates, peroxides, elemental carbon, and gaseous co-pollutants. As noted above, there is substantial work underway to evaluate and discriminate among all these hypotheses. It is critically important to do this so that PM controls are focused on actions that improve public health.

In the case of ozone, the existing California standard is very close to peak once-per-year background levels. Since tightening the standard would not result in significant reduction in risk to children or others and any tightening of the standard would render it unachievable, we recommend against making ozone a priority for review under SB 25. The case for putting nitrogen dioxide in the first tier is weak. The controlled exposure studies cited suggest possible concern at concentrations above the existing standard. On the other hand, the existing state standard has been met everywhere in California, and ambient concentrations are expected to continue to decline for at least the next decade.